

ELEMENTES OF GEOME- TRIE.

Written in Latin by that
excellent Scholler, P. Ramus, Profes-
sor of the Mathematicall Sciences in
the Vniuersitie of Paris: And faithfully
translated by Tho. Hood, Mathe-
maticall Lecturer in the Citie
of London.

Knowledge hath no enemy but the ignorant.



L O N D O N

Printed by Iohn Windet, for Thomas
Hood, and are to be sold in the Staplers
Chappell within Leaden Hall, where the Mathe-
maticall Lecture is read: or in Marklane
at the house of Francis Cook.

1590.





TO THE RIGHT

Honourable, Sir Iohn Harte,
Lord Mayor, and to the worshipfull
his brethren, the Aldermen of
the Citie of London,



I is now two yeares al-
most (Right honorable
& worshipfull) since I
first beganne to reade
the mathematicall le-
cture in this citie, so
that the time limited
vnto me at the first is all most expired. In
thistime I haue binne diligent to profite, not
onlie those yong Gentlemen, whome comon
lie we call the captaines of this citie, for
whosc instruction the Lecture was first un-
der taken, but allso all other whome it
pleased to resorte vnto the same: There haue
binne present at sondrie times sondrie graue

THE EPISTLE

and wise men, desirous to see the maner of
proceedinge in the thinge, namelie the right
worshipfull, Syr George Barnes, and
Maister recorder, and others, whose allow-
ance of the lecture hath binne suche as I did
wishe. Moreouer, the right honorable, Sir
Francis walsingham did wright vnto your
honour, both concerning the profite that
might arise vnto the realme by the saide
lecture, and also concerninge the conti-
nuance thereof. It hath pleased your Hon-
oure and the worshipfull your bretheren so
to geue eare vnto these mens verdictes that
you haue vouchsafed to continue this lec-
ture, & to ratifie my wages as before. Seeing
therfore (Right honorable) it hath pleased
you to continue that fauor towards mee,
which other haue shewed in chusing mee be-
fore others to be mathematical lecturer in so
honorable and famous a city as this is, I am
bolde to present vnto you this small worcke
imprinted for the behoof of mine auditorie.
Most humblie requestinge that as you with
the worshipfull your bretheren haue vouch-
safed

DEDICATORIE

*safed to be my well willers, so you woldo be
patrone to my worcke, whereby I shalbe en-
coraged not onlie to go forwarde in my
studie endeuoringe my selfe to be profita-
ble in what I maie to this common
wealthe, but allso to praie for
your encrease in all
good thinges*

Your Honours and Worships

most humble

Tho. Hood.

To the frendly Auditors of the Mathematicall Lecturer.



HIS labour (louing Auditours) I haue vndertaken for your sake, and haue for your vse procured the printinge of the same, and that somuch the rather, because it is a thinge moſte conuenient for you to learne, and me to teache. For this I knowe bothe by experience, and reading, that he which attempteth anie notable thinge in the Mathematicall ſciences, or anie humane knowledge els withoute geometrie, dothe as one, that attempteth to flie without his winges. Conſidering therefore the thinge is ſo neceſſarie for your inſtruction, I requeſt your good acceptation of the ſame. If anie thing ſeem faultie, beare with it. If anie thing ſeeme ſtrange, or hard, truſt vnto me, vnder god, that accordinge to myne vſuall maner I will make it familiar, and plaine enough for your vnderſtanding.

The demonſtrations which are in this worke moſt neceſſary, are not yet finiſhed becauſe they were manie, and my leysure

sure but small, but you shall haue them
shortelie imprinted for youre vse. In
the meane time, let the booke as
it is, be vnto you a signe of
my good will to fur-
ther youre kno-
ledge.

Yours Tho. Hood.

A note to be obserued in reading this booke.



Hat which is printed in the greater letter is the geometricall proposition it selfe.

That which is in the lesser letter is a consequent of the proposition. Where you finde any figures following after anie proposition, as thus: 1.p.1.2.p.6.3.d.6 .also, e.34.p.1. & such like. The first figure standeth for the number of the proposition, the second standeth for the number of some booke of *Euclide*, out of which it is taken. The p. signifieth proposition the d. definition : the e. signifieth out, as , that it is taken out of the 34. proposition &c.



THE FIRST BOOKE OF Peter Ramus his Geometric con- cerning Magnitude.



Geometry is the Arte of measuring well.

2 The thing propounded to be welmeasured, is Magnitude.

3 Magnitude is a continual quantitie.

4 Continually is that, whose parts are continued by some comon terme.

5 A terme is the end of a magnitude.

Therefore

A magnitude is both infinitely made, continued, and divided by those things wherewith it is termed.

6 A point is an yndivisible signe in a magnitude.

7 Magnitudes commensurable are such as one and the selfe same measure doeth measure. Contrariwise they are incommensurable. 1. & 2. d. 10.

8 Rational magnitudes are those whose rationalitie may bee expressed by the number of some measure geuen. Contrariwise they are irrational.

9 Congruall, or agreeable magnitudes are those, whose parts being applyed one to an other, fill an equall place.

Therefore

Congruall or agreeable magnitudes are equal, 8 a xi. i.

A

10 Mag-

Ramus his

10 Magnitudes are ascribed one with another betweene themselves, when the termes of the one are limited with the termes of the other: That which is within, is said to be inscribed: that which is without is said to be circumscribed.

The second Booke of P. Ramus his Geometrie, concerning a Line.



Magnitude is either a line, or lineate.
2 A line is a magnitude only long.
3 The terme of a line is a point.
4 A line is either right or crooked.
5 A right line is that which lyeth equally betweene his tearmes.

A crooked line lieth contrariwise.

Therefore

A right line is the shortest between the same termes.

6 A crooked line is touched by a right, or crooked line, when both of them doe meete so together that being continued, they be not cut one by the other.

Therefore

A touch is made in one point. 13. p. 3.

7 A crooked line is a circumference, or helix.

8 A circumference is that which is equally distincte from the midst of the space conteyned in it.

Therefore

A circumference is made by the turning about of a line, the one end thereof standing still, the other making a line.

9 An helix is that which is vnequally distant from the midst of the space conteyned within, howsoeuer.

10 Lines are right one to the other, whereof the one falling on the other, lieth equally. Contrariwise they are oblique one to the other. 10. d. 1.

Therefore

Geometrie.

2

If a right line be perpendicular vnto a right line, it is but one onely, from one and the selfe same point, and one end the selfe same side. 13. p. 11.

11 Parallele lines are those which are equally distant euery where. 35. d. 1.

Therefore

Lines parallele vnto one and the selfe same line, are also parallele one to another.

The third booke of P. Ramus, concerning an Angle.



Lineate is a magnitude more than long.

2 Vnto a lineate belongeth angle and figure.

3 An angle is a lineate consisting in the common section of the termes.

4 The feet of an angle are the termes comprehending the angle.

4 Angles homogeneall, are angles of one kinde, as well in regard of their feete, as also in regarde of the meeting together of their feete.

5 Angles agreeable in their feete are equall.

Therefore

1 If an angle hauing equal feete to another angle, be also equall in the base, it is equall to the other angle: and if it be equall, it hath the base also equal. 8. & 4. p. 1.

Item

2 If being equall in the base, it haue also the feete equall, it is equall to the other angle.

Item

3 If an angle hauing feete equall to the feet of another angle, be greater in the base, that angle is the greater. and if it be greater, it is greater in the base. 25. & 24. 1.

Item

4 If being equall in the base it be lesser in the feete,

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(the feete being conteyned within the feete of the other angle) is the greater angle.

Therefore

5 If feete homogeneall to the feete of an angle geuen, and equall at the base, be placed at a point geuen, they shall make an angle cquall to an angle geuen. 23.p.1. and 26.p.11.

7 An angle is either right, or oblique.

8 A right angle is that whose feete are right one to the other. Contrariwise it is an oblique angle.

Therefore

Angles hauing their feet right one to another, are equal.

9 An oblique angle is either obtuse, or acute.

10 An obtuse angle is an oblique angle, greater then a right angle. 11.d.1.

11 An acute angle is an oblique angle, lesse then a right angle. 12.d.1.

The fourth book of P. Ramus, concerning a Figure.



Figure is a lineate magnitude, limited on euery side.

2 A Centre is the middle point in a figure.

3 A perineter is that which incloseth a figure.

4 A Radius is a right line drawn from the centre to the perimeter.

5 A diameter is a right line inscribed in a figure through the centre.

Therefore

1 In one & the same figure there be infinite diameters.

Item

2 The centre of a figure is in the diameter.

Item

Item

3 *It is in the concurrence of the diameters.*

6 The altitude is the perpendicular line, drawn from the top of a figure to the base.

7 An ordinate figure, is a figure of equall termes and equall angles.

8 A prime figure is that which cannot bee deuided into other figures more simple then it selfe.

9 A rationall figure is that which is comprehended vnder a base and altitude rational one to another.

Therefore

The number expressing a rationall figure, may be called a figured number, and the numbers whereof it is made, may be called the side of that figured number.

10 Isoperimetrell figures, are figures of an equall perimeter.

11 Of homogeneous isoperimetral figures, that which is more ordinate: of heterogeneous isoperimetreall figures beinge ordinate, that which hath most sides is the greater.

12 If prime figures be of equall altitude, they are as their bases are; and contrariwise.

Therefore

If they consist vpon an equall base they are equall.

13 If prime figures be reciprocally in their base, and altitude, they are equall: and contrariwise.

14 Like figures are figures equiangle, proportionall in the feete of the equall angles.

Therefore

1 *They haue their termes subtended to the equall angles, correspondencie proportionall; and equall, yf the figures themselves be equall.* Item

2 *They be situate alike, when their proportionall sides doe answere one another in like situation.*

Item

3 *Those which are like to one and the same figures are like*

Ramus his

like one to another.

Item

4 If partes like to the partes of the figure geuen, and in like maner situate be placed vpon a terme geuen, there shalbe placed vpon the said terme, a figure like to the figure geuen and in like maner situate.

15 Like figure haue the proportio of their correspondent proportionall sides equimultiplex to their dimensions, and the meane proportionall lesser by one.

Therefore

1 If right lines bee continuallie proportionall more by one then the dimensions of the figures are which are like and in like maner situate on the first and second line, as the first right line is vnto the last, so is the first figure vnto the seconde: and contrariwise.

Item

2 If 4. right lines be proportionall, the like figures in like manner situate vpon them are proportionall: and contrariwise.

16 Those figures fill aplace, which beinge placed any maner of waye, about one point, doe leaue no emptie roome.

17 A round figure is that, whose Radii be all equall.

Therefore

1 In a rounde figure the diameters are diuided into equall beames.

2 Those rounde figures, whose diameters are equall, are equall one to another. e. 1. d. 3.

The fifth book of P. Ramus his geometrie concerning lines and angles, drawn in a plaine surface.

A Lincate magnitude is either a surface or a bodie.
2 A Surface is a lincate magnitude onlie broad.
s. d. 1.

3 The

- 3 The terme of a surface, is a line. 6. d. 1.
- 4 A Surface is ether plane, or bowed.
- 5 A plane surface is that, which lyeth equallie between his termes. c. 7. d. 1.

Therefore

1 We maye in a plane surface from a pointe to a pointe draw a right line. 1. & 2. post. 1.

Item

2 At a pointe geuen wee may set a right line equall to a right line geuen, and from the greater right line geuen we maye cut a line equall to the lesser line geuen. 2. & 3. p. 1.

Therefore

One right lyne, or two, beinge cut one by another, are in one and the same plane surface. 1. & 2. p. 11.

Item

3 A right line beinge geuen in a plane, you maye describe a circumference.

Therefore

The radii of the same circumference, or of equall circumferences, are equall.

6 If 2 equall circumferences drawen from the endes of the equall feete of a right lined angle geuen, do concurre on the foreparte of the angle, the right line drawne from the concurse, vnto the top of the angle, shall cut the angle into 2. equal peeces. 9. p. 1.

7 If 2. equall circumferences drawen from the ends of a right line geuen, doe concur on both sides of the line, the right line drawne through each concurse shall cut the lyne geuen into 2. equall peeces. 10 p. 1.

8 If a right line stande perpendicular vpon a right line, it maketh the angles on each side right angles: and contrarywise.

Therefore

2 If a right line stande vpon a right line it maketh the side angles equall vnto 2 right angles: and contrarywise. c. 13. & 14. p. 1.

Item

3 If

2. If 2 right lines be cut the one by the other, they make the head angles equall one to another, and all the angles equall vnto 4. right angles. 15. p. 1.

Item

3. If right lines being cut by a right line, the inwarde angles on one side be greater then 2. right angles, the opposite angles are lesser.

9. If from a pointe geuen in a right line geuen being infinite 2. equall peeces be cut on each side the point, and from the pointes of the sections 2. equall circumferences do concurre, a right line drawn from the pointe geuen vnto the concurse, shalbe perpendicular vnto the line geuen. 11. p. 1.

10. If a peece of a right line geuen being infinite, be cut by a circumference drawn from the point geue with out the line, the right line drawn from the saide pointe, diuiding into 2 equall partes the said piece of the line, shall fall perpendicular vpon the line geuen 12. p. 1.

11. If 2 right lines being in one plane surface doe neuer concurre, those right lines are paralleles. 35. d. 1.

Therefore

If a right line being infinite, doe cut one of the right parallele lines being infinite, it will cut the other.

12. If right lines being cut by a right line be parallele, they make the inwarde angles on one and the same side equall vnto 2 right angles, and also the alternate angles, equall the one to the other, and the outwarde angle equall to the inwarde opposite angle, and contrarywise: 29. 28. 27. p. 2.

Therefore

If right lines ioyned together with a right line, doe make the inward angles on the same side lesser the 2. right angles, those right angles continued on the same side, wil meet together.

Item

Geometrie.

2 A right line ioyning together right parallele lines,
is in the same plaine surface with them. 7. p. 11.

Item

3 If a right line drawn frō a point geuen, doe make an
angle with a line geuen, the one side of the angle equall
and alternate to the angle that was first made, shalbe pa-
rallele vnto the right line geuen. 31. p. 1.

Item

4 The angles whose alternate feete are parallels, are
equall.

Item

5 If paralleles doe enclose paralleles, the opposite paral-
lels are equal. c. 34. p. 1.

Item

6 If right lines doe limite on one and the same side, e-
quall and parallele lines, those right lines are also paral-
leles. 33. p. 1.

13 If right lines be cutte by diuers parallele right
lines, the segments are proportionall. c. 2. p. 6. & 17. p.
11.

Therefore

1 If a right line making an angle with a right line ge-
uen, be cut according to a proportion assigned, the paral-
lele lines drawn from the termes of the segment to the
end of the right line geuen, and the point at all aduen-
tures falling out therein, shall cut the line geuen accord-
ing to the proportion assigned.

Item

2 If 2. right lines geuen making an angle, be continued
out in length, the first equally vnto the second, the se-
cond infinitely, the paralleles drawn from the rearmes of
the first continuasion, to the beginning of the second,
and a point hapning at all aduentures in the same, shall
cut out the 3. proportionall line.

Item

3 If of 3. right lines geuen, the first and the thirde ma-
king an angle, be continued out in length, the first equally
vnto

unto the second, the third infinitely, the parallele lines drawn from the termes of the first continuation to the beginning of the second, and a point falling out at all ad-
mentures in the same, shall cutte out the fourth propor-
tionall line.

The sixt book of P. Ramus his geo- metric, concerning Triangle.



Ike planes haue the proportion of their
correspondent proportionall sides dou-
bled, and one meane proportionall. e. 20
p. 6. 11. & 18. p. 8.

- 2 A plane is either right lined, or croo-
ked lined.
- 3 A right lined plane is that which is conteyned vn-
der right lines.
- 4 A right lined plane maketh his angles equal vnto
right angles: namely, the inwarde angles generally
are equall vnto the euen numbers frō 2. forward, but
the outward angles are equal but to foure right an-
gles.
- 5 A right lined plane is either a triangle, or trianga-
late.
- 6 A triangle is that which is contained vnder three
right lines. 21. d. 1.

Therefore

1 Of right lined planes a triangle is a prime figure.

Item

- 2 If a right line being infinite, doe cut the angle of a tri-
angle, it curteth also the base thereof.
- 7 Any two sides of a triangle are greater then the
third side remayning.

Therefore

1 If of three right lines any two be greater thē the third,
and

and 2. circumferences from the termes of the one, according to the length of the other two remayning, do concur, the radii drawen from the concourse of those two circumferences, vnto the said termes, shall make a triangle.

Item

2 If two equall circumferences, drawn from the termes of a right line geuen according to the distance thereof, doe concur, the right lines drawen from the concourse of those circumferences vnto the termes aforesaid, shall make an equilateral triangle vpon the line geuen. 1. p. 1.

8 If a right line in a triangle be parallele to the base it cutteth the feete proportionally, and contrariwise. 2. p. 6.

9 The 3. angles in a triangle are equall vnto two right angles. 32. p. 1.

Therefore

1 Of a triangle any 2. angles are lesser then two right angles.

Item

2 The side of a triangle being continued forth at length, the outwarde angle is equall to the two inwarde and opposite angles,

Therefore

It is greater then anye inwarde opposite angle.

10 If a triangle haue equall feet, the angles at the base are equall: and contrarywise. 5. & 6. p. 1.

Therefore

1 If the equall feete of a triangle be continued forth the angles vnder the base wil be equal.

Item

2 If a triangle be equilateral, it is equiangle: and contrarywise.

Item

3 An angle of an equilateral triangle is as great as $\frac{2}{3}$ of a right angle.

4 Sixe equilateral triangles do fill a place.

The

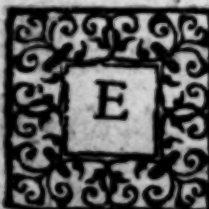
Ramus his

11 The greter side of a triagle, subtēdeth the grea-
ter angle : and the greater angle is subtended by
the greater side .19.&.18.p.1.

12 If a right line in a triangle doe diuide an angle
into two equal parts, it cutteth the base according
to the proportion of the feete : and contrariwise.
3.p.6.

THE SEVENTH BOOKE

of P. Ramus his geometrie cōcer-
ning the cōparing of triāgles.



Quilater Triangles are equiangle-
8.p.1.

2 If 2 triangles be equall in their
angles, either in 2 angles conteyned
vnder equall feete, or in 2 angles
whose side, or base of both is equall, those trian-
gles are equilater. 4.&.26.p.1.

3 Triangles are equall in their 3 angles.

Therefore

If 2 angles of 2 triangles be equall, the rest are equall.

4 If a triangle hauing feet equall to the feete of a-
nother triangle, be greater in the base, it is grea-
ter also in the angle which is contayned vnder the
equall feete: and contrarywise. 25.&.24.p.1.

5 If a triangle placed vpon the same base with an-
other triangle, be lesse then the other triangle in
regarde of his feete (those feete being contayned
with in the feete of the other triangle) in regarde
of the angle conteyned vnder those feete, it is gre-
ter.

6 Triangles of equall heighth, are in proportion as
their bases. c.1.p.6.

Therefore

1 In an equall base, they are equall.

Item

2 If a right line drawn from the toppe of a triangle do divide the base into 2 equall partes, it diuiderh also the triangle into two equall partes, and it is the diameter of the triangle.

7 If a right line be drawn from the toppe of a triangle, vnto a point geuen in the base not being in the midst: and from the midst of the base vnto the side of the triangle be drawn a line parallele vnto the aforesaid line, a right line drawn from the top of this parallele vnto the aforesaid point, shall cut the triangle into two equal peeces.

8 If equiangle triangles be reciprocal in the sides of the equall angle, they are equall: and contrariwise. 15. p. 6.

9 If 2. triangles be equiangle, they are proportional in their feet: and contrariwise. 4. & 5. p. 6.

Therefore

If a right line, in a triangle be parallele vnto the base: it cutteth of a triangle equiangle to the whole triangle, and lesser in the base.

10 If 2. triangles be proportional in the feet of an equall angle, they are equiangle. 6. p. 6.

11 If being proportionall in their feet, & alternatly parallele, they make an angle in the midst between them, they haue their bases continued in a right line. 32. p. 6.

12 If they haue one angle equal, and another proportional to their feet, and the third angle homogeneousall, they are equiangle. 7. p. 6.

THE

THE EIGHT BOOKE OF P. Ramus his geometrie, concer- ning the kindes of triangles.



Triangle is either right angled, or oblique angled.

2 A right angled triangle, is that which hath one right angle: an oblique angled which hath non. 17. d. 1

Therefore

1 If 2. perpendicular lines be ioyned together with another line, they shal make a right angled triangle.

Item

2 If the angle at the base of a triangle, be a right angle, a perpendicular falling from the top of the triangle, is one of the feete.

3 If a right angled triangle haue equal feete each of the angles at the base is the halfe of a right angle, and contrariwise.

Therefore

1 If the one angle of a triangle be equall to the rest, it is a right angle.

Item

2 If a right line drawn from the toppe of a triangle, cuttinge the base into 2 equall peeces be equall vnto either of the 2 peeces, the angle at the toppe of the triangle is a right angle.

4 A perpendicular in a triangle, drawn from a right angle to the base, doth cut the triangle into 2 triagles like vnto the whole, and one to another 8. p. 6.

Therefore

1 The prependicular is the proportionall line betwene the segments of the base.

Item

2 Either

2 Either of the feete are proportionall betweene the base and the segmente of the base next adioyninge unto it.

5 If the base of a triangle do subtende a right angle, the right lined figure made vpon the base is equall to the right lined figures like and in like manner situate vpon the feete.

6 An oblique angled triangle, is either obtuse-angled or acute-angled.

7 An obtuse-angled triangle is that which hath one obtuse angle .28.d.1.

Therefore

1 If the obtuse angle be at the base, a perpendicular drawn from the topp of the triangle, falleth without it.

Item

2 If the one angle of anye triangle be greater then the other two, it is an obtuse angle.

Item

3 If a right line drawn from the topp of a triangle diuidinge the base into two equall peeces, be lesse then either of the 2 peeces, the angle at the topp of the triangle, is an obtuse angle.

8. An acute-angled triangle is that which hath all the angles acute .29.d.1.

Therefore

1 A perpendicular from the topp, doth fall within it.

Item

2 If an angle of a triangle be lesse then the other 2. it is acute.

Item

3 If a right line drawne from the topp of a triangle, diuidinge the base into 2 equall peeces be greater then one of those peeces, the angle at the topp of the triangle is an acute angle.

The

The ninth book of P. Ramus his geometrie, concerning the measuring of the right lines by the help of like rectangled triangles.



he Jacobs staffe is a square consisting of vnequall feete.

2 The feete of the staffe are the index and the transuersarie.

3 The index is to the transuersarie double and $\frac{1}{10}$ parte thereof.

4 The tranluerfarie is to be moued vpon the index some tymes higher, sometymes lower.

5 If the sight passe from the begining of the one foote it passeth by the ende of the other, and the one foote is right with the magnitude that is to be measured, the other is parallele,

6 The length and heighth of a magnitude haue a threefolde measure? the first and seconde kinde of measure requireth but one distance one an others dimension being geuen for the thirde proportionall number. The third kinde of measure requireth 2 distances and so is the bredth only to be measured.

7 If the sight passe from the begining of the index, being right to the thing measured, vnto the end of length: as the segment of the index shalbe vnto the segment of the transuersarie so is the height of the measurer vnto the length.

8 If the sight passe from the end of the index lying parallele vnto the thing measured, as the segment of the transuersing shalbe vnto the segment of the index, so is the height geuen vnto the length.

9 If the sight passe from the ende of the transuersaire being parallele, as in the index, the difference of

of the greater segment is vnto the lesser, so is the difference of the second distance vnto the lengthe.

10. If the sight passe from the ende of the transuersarie being right, as the segment of the transuersarie shalbe vnto the segment of the index, so is the length geuen vnto the height.

Therefore in a reuerfed altitude

If the sight passe from the ende of the index being parallel vnto the thinge measured, as the segment of the transuersarie shalbe vnto the segment of the index, so is the length geuen vnto the reuerfed altitude.

11. If the sight passe from the beginning of the index being right as the transuersarie, so is the assigned longitude vnto the height.

Therefore

If the sighte passe from the beginning of the index being right by the vanes of the transuersarie to the termes of some knowne partes, as the distance of the vanes is vnto the rest of the transuersarie aboue the index, so is the parte knowne vnto the remaynder.

12. If the sight passe from the beginning of the index being right, as in the index the difference of the segment shalbe vnto the difference of the distance, so is the segment of the transuersarie vnto the height of the thinge measured.

Therefore

By the measure of one altitude, wee maye knowe the difference of 2. altitudes.

13. If the sight passe from the beginning of the index, being right, by the vanes of the transuersarie, to the termes of the breadth; as in the index the difference of the segment is vnto the difference of the distance, so is the distance of the vanes vnto the breadth.

B

The

The tenth booke of P. Ramus his

Geometrie concerning a Triangulate
and a parallelograme.



Triangulate is a right lined figure
made of triangles. Therefore

1 The sides of a triangulate are more by
two, then the triangles whereof it is
made. Item

2 Homogeneall triangulates are divided
into triangles equall in number .e. 20. p. 6.

2 Like triangulates are divided into triangles like
one vnto another, and in proportion correspondent
vnto the whole.

3 A triangulate is a quadrangle, or a multangle.

4 A quadrangle is that which is containd vnder 4
right lines .22. d. 1.

5 A quadrangle is either a parallelogramme or a
trapezium.

6 A parallelogramme is a quadrangle parallele in
the opposite sides. Therefore

1 If right lines, vpon one and the same side, do enclose
equall and parallele lines they wil make a parallelogramme.

Item

2 A parallelogramme is equall both in his opposite sides, and
angles, and segments cut out by the diameter.

Item

3 The diameter of a parallelogramme is parted into two
equall pcees by equall radij. Item

4 A parallelogram is double to the triagle equall in base
and height. e. 41. p. 1. Item

5 It is equall to the triangle which is of the same height
and double in the base .42. p. 1.

7 A parallelogramme consisteth both of 2 diago-
nalls.

alls and complements, and gnomons.

8 diagonall is a particular parallelogramme, having both an angle and a diagonall line common with the whole parallelogramme.

9 The diagonall is like to the whole, and in like maner situate .e.24.p.6.

Therefore

If a particular parallelogramme have an angle common with the whole parallelogramme and be also like unto the whole, and in like sorte situate, it is a diagonall .26.p.6.

10 A complement is a particular parallelogramme containd vnder the next adioyning sides of the diagonalls

11 Complementes are equal .43.p.1.

Therefore

If one complemente be made equall to a triangle geuen in a right lined angle geuen, the other complement made upon the right line geuen, shalbe equall also unto the same triangle .44.p.1.

Item

2 If parallelogrammes be continuallie made equall unto the triangles of a triangulate geue in a right lined angle geuen, the whole parallelogramme shalbe equall also to the whole triangulate .45.p.1.

Therefore

A parallelogramme is equall to his diagonalls, and complementes.

12 A Gnomon is either of the two diagonalls together with the 2 complementes .2. d.2.

13 Parallelogrammes of equall heigth are as their bases .1.p.6.

Therefore

Parallelogrammes of equall heigth, having equall bases, are equall .35.36.p.1.

14 If equiangle, parallelogrammes be reciprocal in the secte which include the equall angle, those pa-

B 2

ral

rallelogrammes are equall, and contrariwise. 15. p. 1.

Therefore

1. If 4 right lines be proportionall, the parallelogramme made of the 2. middle lines, is equal to the equiangle parallelogramme made of the 2 extreme lines. e. 16. p. 6.

Item

2. If 3 right lines be proportionall, the parallelogramme made of the middle line, is equall to the equiangle parallelogramme made of the extreme lines.

The eleuenth book of P. Ramus his

geometrie concerning a right angled Parallelogramme.



Parallelogramme is either right-angled, or oblique-angled.

2. A right angled parallelogramme is that which hath all his angles right.

Therefore

1. A right-angled parallelogramme is contained under 2. right lines, comprehending a right angle. 1. d. 2. Item

2. Four right angled parallelograms doe fill a place.

3. If the diameter cut the side of a right-angled parallelogramme into two equall peeces, it cutteth the said side at right angles, and contrariwise.

Therefore

If a right line inscribed doe cut the side of a right angled parallelogramme into two equall peeces at right angles, it is the diameter of the parallelogramme.

4. A right angled parallelogram is equal to the right angled parallelograms made of one of his sides, and the segments of the other. 1. p. 2.

5. If 4. right lines be proportionall, the right angled parallelogramme made of the middle lines is equall to the right angled parallelogrammes made of the vtmost lines. 16. p. 6.

61 The figured number of a rational rectangled parallelogramme, is called a plaine number. 16.d.7.

The 12. booke of P. Ramus his geometric concerning a square.



Right angled parallelogramme is either a square, or an oblong.

2 A square is a right angled equilateral parallelogramme. 30.d.1.

Therefore

1 The sides of equall squares are equal. Item

2 The possibilitie of a right line is a square.

Item

3 If two equall perpendicular lines, joyning one with another, be enclosed together by parallele lines, they wil make a square. 46.p.1.

3 The plaine number of a square is a plaine number of equall sides.

Therefore

It is made of a number multiplied by it selfe.

4 If three right lines bee proportionall, the square made of the middle line is equall to the right angled parallelogram made of the two vtmost lines: & contrariwise. 17.p.6. & 20.p.7.

5 If the base of a triangle subtend a right angle, it is equipollent vnto his feete, and contrariwise. 47. & 48 p.1.

1 If the square of an od number geuen for the first foote, haue an vnitie taken from it, the halfe of the remainder shalbe the other foote, and the same halfe increased by an vnitie, shalbe the base.

2 If halfe an euen number geuen for the first foote, be squared, the square number being diminished by an vnitie, shalbe the other side, & increased by an vnitie, it shalbe the base.

rallelogrammes are equall, and contrariwise. 15. p. 1.

Therefore

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Item

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2. Foure right angled parallelograms doe fill a place.

3. If the diameter cut the side of a right-angled parallelogramme into two equall peeces, it cutteth the said side at right angles, and contrariwise.

Therefore

If a right line inscribed doe cut the side of a right angled parallelogramme into two equall peeces at right angles, it is the diameter of the parallelogramme.

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6 The

Geometric.

II

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5 If the base of a triangle subtend a right angle, it is equipollent vnto his feete; and contrariwise. 47. & 48 p.1.

1 If the square of an od number geuen for the first foote, haue an unitie taken from it, the halfe of the remainder shalbe the other foote, and the same halfe increased by an unitie, shalbe the base.

2 If halfe an euen number geuen for the first foote, be squared, the square number being diminished by an unitie, shalbe the other side, & increased by an unitie, it shalbe the base.

Ramus his

3 *The diagonall line is in power double to the side, and is incommensurable vnto it.*

6 If the base of a right angled triangle be cut in double proportion, by a perpendicular comming from the right angle, it is in power sesquialter to the greater foote, and treble to the lesler.

But if the base be cut in quadruple proportion, it is sesquiquarta to the greater side, and quintuple to the lesler ad. 13. 15. 16. p. 13.

7 If a right line be cut into how many parts soeuer, it is in power the multiplex of the segmēt, the square of the number of the section being denominator thereof.

8 If a right line be cut into two segments, the square made of the whole line, is equall to the squares made of the segments, and to the two right angled figures comprehended vnder them both. 4. p. 2.

Therefore

The side of the first diagonall is the side of one of the complements, and being doubled, it is the side of the both: but the side remaining of the two complementes is the side of the other diagonall remaining.

If the side found out be doubled, and to the double there be an vnitie added, the totall number shalbe the gnomon of the next greater square.

The measure of a Triangle.

9 If from the halfe of the sides of a triangle geuen, being added together, the sides be seuerally subducted, the side of the number made continually by the said halfe and the remainders, shalbe the content of the triangle.

10 If the base of a triangle do subtende an obtuse angle, it is in power more then the seete, by the right angled figure twice taken, which is containd vnder one of the seete and the line continued from the

the

the saide foote vnto the perpendicular drawn from
the toppe of the triangle. 12.p.2.

The thirenth booke of P. Ramushis

Geometrie concerninge a longe
square.



N oblonge, is a rectangled parallelo-
gramme, being not equilater. 31. d. 1.

2 An oblonge made of an whole line
and a parte thereof, is equall vnto the
right angled figure made of the partes,

and to the square made of the foresaid parte. 3.p.2.

3 Oblonges made of an whole line and the partes,
are equall vnto the square made of the whole line
.2.p.2.

4 Two oblonges made of an whole line and a parte
thereof, with the square made of the parte remay-
ning, are equall to the squares made of the whole
line, and the foresaid parte. 7.p.2.

5 The base of an acute angled triangle is in power
lesse then the feete by 2 oblonges made of one of the
feete, and a peece thereof, accompted from the said
angle to the perpendicular line, drawn from the
toppe of the triangle. 13.p.2.

Therefore

*If the square of the base of an acute angle be taken from
the squares of the sides the halfe of the remaynder being
diuided by the side, the quotient shalbe the parte of the di-
uiding side, from the said angle vnto the perpendicular
drawn from the toppe.*

6 If a right line be diuided into 2 equall parts, and
otherwise the oblonge made of the vnequall partes
together with the square made of the intersegmente
is equall to the square made of the one of the equall
partes. 5.p.2.

7 If

Ramus his

7 If a right line be cut into 2 equall partes, and continue out at length, the oblonge made of the line continued, and the continuation with the square made of the one equall parte, is equall vnto the square of the line compounded of the one halfe, and the continuation. 6. p. 2.

8 If a Mesographus, touching the angle opposite to the angle made of the lines geuen, do cut in equal distance from the centre, the 2 right lines geuen, containing a right angled parallelogramme & continued out infinitlie, the segments shalbe meane in cōtinuall proportion with the line geuen.

The fourteenth booke of P. Ramus

his Geometrie, concerning a right

*line cut proportionablie, and the
rest of the quadrangles*



Right line is said to be diuided by an extreme and meane proportion, when as the whole shalbe vnto the greater segment, so the greater segment is vnto the lesser. 3. d. 6.

2 If a right line being cut proportionallie be rati-
onall vnto a measure, geuen the segmentes are
irrationall vnto it, and one vnto the other. e. 6. 13.

3 If a square be made of a right line geuen, the dif-
ference of the right line drawn from the angle of
the square made vnto the middest of the next side a-
boue the halfe of the side, shalbe the greater segment
of the line geuen, being proportionally cut. 11. p. 2.

Therefore

*If a right line cut proportionally, be continued according
to the greater section, the whole line shalbe cut proportio-
nally, and the greatest segment thereof shalbe the line ge-
uen. 5. p. 3.*

4 The

4 The greater segment continued by the halfe of the whole line geuen, is in power quintuple vnto the said halfe; and if a right line be in power quintuple vnto his segment, the remainder made double vnto the aforesaid segment, is cut proportionally, and the greater segment is the same remainder. 1. & 2. p. 13.

5 The lesser segment continued by halfe the greater segment, is in power quintuple vnto the same halfe. c. 3. p. 13.

6 A whole line, and the lesser segment are in power treble vnto the greater. c. 4. p. 13.

7 An oblique angle parallelogramme, is a Rhombus, or a Rhomboides.

8 A Rhombus is an oblique-angled equilater parallelogramme. 32. d. 1.

9 A Rhomboides is an oblique-angled parallelogramme, not equilater. 33. d. 1.

10 A trapezium is a quadrilater triangulat, not parallelogramme. 34. d. 1.

11 A multangle is that which is comprehended vnder more then foure right lines. 23. d. 1.

12 If an equilater pentagon haue three angles equall, that pentagon is equiangle. 7. p. 13.

Maltriangle triangulate figures are measured also by their triangles.

The 15. booke of P. Ramus his geometry, concerning the lines of a circle.



Circle is a round plaine. c. 15. d. 1.

2 Circles are as the squares made of their diameters, 2. p. 12,

Therefore

Their diameters are as the circumferences.

Ramus his

3 Geometry concerning circles, is either in the lines, or in the segments of a circle.

4 If a right line bee limited in the circumference with two points, it shall fall within the circle. 2. p. 3.

5 If from the one end of the diameter there bee described a circumference, hauing a radius taken out of the said diameter, equall to a right line geuen, the right line drawn from the aforesaid end of the diameter, vnto the concurse of the two circúferences, shalbe inscribed in the circle geuen equall vnto the right line geuen. 1. p. 4.

6 If a right line inscribed diuide into 2. euall parts a line inscribed, it is the diameter of the circle, & the midst thereof is the centre of the circle. 1. p. 3.

Therefore

1 If two right lines doe cut at right angles into two equal parts two right lines inscribed, the concurse of the 2. lines making the euall partitions, shalbe the centre of the circle. e. 25. p. 3.

Item

2 By this meane we may describe a circumference, which shall passe by three points not being in a right line.

7 If the diameter cut a line which is no diameter into two euall parts, it cutteth it at right angles. 3. p. 3

8 If lines being no diameters doe cutte one another, the segments are vnequall. 4. p. 3.

9 If two right lines inscribed be cut one by the other the right angled parallelogramme made of the segments of the one, is equall vnto the right angled parallelogramme made of the segments of the other. 35. p. 3.

10. Inscribed lines are equidistante from the centre, when the perpendicular lines drawn vnto them from the centre, are equall. 4. d. 3.

11 If inscribed lines be equall, they are of equall distance from the centre, and contrariwise. 14. p. 3.

12 Of vnequall inscribed lines the diameter is the greatest: and that which is nearest vnto the diameter is greater then that which is farther of: the farthest of from the diameter is the least, and the next vnto the least is lesse then that which is further of: and two onely on each side from the diameter are equall .c.15.p.3.

13 Of right lines drawn vnto the circumference from a pointe of the diameter not being the centie that which passeth through the centie is the greatest: and the nearest vnto the greatest, is greater then that which is further of, the residue of the greatest is the least, & the next vnto the least is lesse then that which is further of: and only 2. on each side from the greatest or the least, are equall .7.p.4.

Therefore

If a point in a circle be the terme of 3 equall right lines drawne vnto the circumference, it is the centre of the circle. 9.p.3.

14 Of right lines drawn from a point geuen with out in to the concauitie of the circumferencethat which passeth thorughe the the centre is the greatest and the next vnto the greatest is greater then that which is further of: But of those right lines which are drawn from the foresaide pointe vnto the convexitie, the segment of the greatest is the the least and the next vnto the least is lesser then that which is further of, and onlie 2 on each side from the greatest, or the least, are equall .8.p.3.

15 If a right line be perpendicular to the end of the diameter, it toucheth the circumference; and contrariwise. c-16.p.3.

Therefore

1 If a right line passe through the centre and the touch it is perpendicular to the touching line .18.p.3.

Item

2. ff

Ramus his

2 If it be perpendicular to the touching line, it passeth through the centre, and the touch. 19. p. 3. Item

3 The poynte wherein the touch is made, is that wherein the line drawn from the centre, falleth perpendicularly upon the touche line. Item

4 The touch line is but one upon one and the same side. Item

5 The touch angle is lesse then any right line acute angle. e. 16. p. 3.

6 The touch angles in equall circumferences, are equall.

16 If a circumference be described by a Radius, drawn from the centre of a circumference geuen; vnto a point geuen with out: and from the concourse of the circumference geuen, and the radius, a line perpendicular vnto the radius it selfe, lighting vpon the circumference described, be ioyned with the aforesaid centre, the right line drawn from the poynt geuen vnto the concourse of the circumference geuen and the line making the coniunction, shall touch the circumference geuen. 17. p. 3.

17 If of 2. right lines drawn from a point without a circle, the first doth cut it vnto the concavities, and the other do but touch the oblong square made of the line cutting, and the outwarde segment of the said line cutting the circle, is equall vnto the square made of the line touching, and if such an oblong be equall vnto the square of the other line remayning, then that line remaining toucheth the circumference.

36. & 37. p. 3.

Therefore

1 Touch lines drawn from one and the same poynte, are equall. Item

2 Oblonges made of any right line from the same poynts cutting a circle, and of the outwarde segment of the said line cutting the circle, are equall one vnto the other.

Item

Item

Two right lines being geuen we maye ioine vnto the one of them a thirde line so, that the oblonge made of the line continued, and the continuatiō shalbe equall vnto the square of the other.

18 If two circumferences be cut one by the other, or touch one another, they are eccentricke: the first are cut one by another in two poyntes onlie: the other continue their diameters through the pointe wherein they touche. 5.6.10.11.12 p.3.

19 If inscribed lines be equall, the cut estuall circumferences: and contrariwise. 28.29 p.3.

The sixtene booke of P. Ramus his

Geometrie, concerning the
segments of a circle.



The segment of a circle is that which is comprehended outwardly vnder a circumference, inwardely vnder a right line.

2 The segment of a circle is either a sector, or a section.

3 A sector of a circle, is a segmēt conteyned inwardly vnder two right lines, making an angle in the centre, which is called the angle in the centre, and the circumference is called the base of the sector. 9.d.3.

4 An angle in a circumference is an angle comprehended vnder two right lines inscribed in a circle, & ioyned together in the circumference. 20.p.3.

5 The angle in the centre, is double to the angle set in the circumferēce, standing vpon the same circumference. 20.p.3.

Therefore

If the angle in the circumference be equall vnto the angle in the centre, it is double in the base.

6 Angles

6 Angles set in the centre or circumference of equal circles, are as the circumference vpon which they stand, and contrariwise. e.33. p. 6. & 26.27. p.3.

Item

As the one sector is to the other, so is the angle to the angle.

7 A section is a segment of a circle conteyned inwardly vnder one right line, which is called the base of the section.

8 A section may be finished the centre being found.

9 The circumference of a section is diuided into 2. e. quall parts, by the perpendicular line diuiding the base into two equall parts. 30. p.3.

10 An angle in the section, is an angle comprehended vnder two right lines, hauing the same termes with the base, and the same termes with the circumference. 7. d.3.

11 Angles in the same section are equall. 21. p.3.

12 Angles in opposite sections, are equall vnto two right angles. 22. p.3.

13 If sections conteyne equall angles, they are like. e.10. d.3.

14 If like sections haue an equall base, they are equall. 23.24. p.3.

15 The angle of the section is that, which is comprehended vnder the termes of the section. 7. d.3.

16 A section is either a semicircle, or vnequall to a semicircle.

17 A semicircle is the halfe section of a circle.

Therefore

A semicircle is conteyned vnder halfe the circumference, and the diameter. 18. d.1.

18 The angle in a semicircle is a right angle, the angle of a semicircle is lesse then a right rightlined angle, but greater then any acute angle. The angle in the greater section is lesse then a right angle: the angle
of

If the greater section is greater then a right angle: the angle in the lesser section is greater then a right angle, the angle of the lesser section is lesser then a right angle. e. 31. & 16. p. 3.

Therefore

1 If two right lines, hauing the same termes with the diameter of a circle, bee ioyned together in one point of the circumference, they make a right angle.

2 If a right line being infinite be cut by a circumference, whose centre is without it, in two points, the one geuen, the other contingent, and the diameter be drawn from the contingent point, the right line from the point geuen, ioyning the diameter, shalbe perpendicular vnto the infinite line.

Therefore

3 If a right line from a point geuen, making an angle with an infinite line, be made the diameter of a circumference, cutting the infinite line, the right line drawn from the point geuen, ioyning the segment, shalbe perpendicular vnto the infinite line.

Item

4 If of two right lines geuen, the greater be made the diameter of a circle, and the lesser, hauing the same terme with the greater, and inscribed, be ioyned to it with another line, the greater line is in power more then the lesser by the square of the line which ioyneth them together ad. 13. p. 6.

19 If a right line continued of two right lines bee made of the diameter of a circle, the perpendicular drawn from the point of the continuatio to the circumference, shalbe the proportionall line between the lines geuen. 13. p. 6.

20 Angles in the opposite sections are equall vnto the alternate angles made of the line, cutting the circle and touching the circle.

Therefore

1 If at the end of a right line geuen, there be a right line

Ramus his

lined angle made equal vnto an angle geuen, and from the toppe of the angle made equall a perpendicular vnto the other side, do concurre with the perpendicular drawen from the midst of the line geuen, the concourse shalbe the centre of the circle described, though the angle which was made equall, in whose opposite section, vpon the line geuen there shalbe made an angle equal vnto the angle geuen. 33.p.3.

2 If the angle made of a right line cutting a circle, and a line touching a circle be made equall to a right line angle geuen, the angle in the opposite section shall in like maner be equall to the same angle. 34.p.3.

The seuententh booke of P. Ramus his Geometrie, concerning the ascription of a circle, and a triangle.



IF the right line figure, ascribed to a circle, equilater, it is equiangle.

1 It is equall vnto a triangle. in the base equall vnto the perimeter: but in the altitude, vnto the perpendicular drawen from the centre vnto the side.

3 Like right lined figures inscribed in circle, are as the squares made of their diameters 1.P.12.

Therefore

2 If the diameter of the second circle be so vnto the side of the second right lined figure inscribed, as the diameter of the circle is to the side of the right lined figure inscribed, and if the seuerall triangles of the figures inscribed be like and in like maner situate, the right lined figures inscribed shalbe like and in like maner situate.

4 If 2. right lines do diuide into equall segments 2. angles of a right lined figure geuen, the circle made of the Radius, drawen from the concourse of those

two lines perpendicular vnto the side, shalbe inscribed in the right lined figure geuen.4.p.4.

5 If two right lines doe at right angles diuide into equall partes, the two sides of a right lined figure geuen, the circle of the radius drawn from their con- course to the angle, shalbe circumscribed about the right lined figure geuen.5.p.4.

6 If two inscribed lines drawn from the touche of a right line, and a circumference, make the 2. angles on both sides equall vnto two angles of a triangle geuen, they being ioyned together, shal inscribe in the circle geuen a triangle, equiangle to the triangle geuen.e.2.p.4.

7 If 2. angles in the centre of a circle geuen, be made equall at the common side vnto the vtmost angle of a triangle geuen, the right lines touching the circum- ference in the feet of the angles, shall circumscribe a triangle about the circle geuen, equiangle vnto the triangle geuen.3.p.4.

Therefore

If a triangle be right-angled, obtuse-angled, acute-an- gled, the centre of the circle circumscribed, is in the side, without the side, within the side, and contrariwise.

The 18. booke of P. Ramus his geometric concerning the ascription of a triangulate.



If right lines touch a circumference in the angles of an ordinate triangulate inscribed, they shall circumscribe about the circle, a triangulate homogeneal to the triangulate inscribed.

2 If the diameters be cut one by the other at right an- gles, the line subtended to the right angle, shalbe the side of a square.e.6.p.4.

Therefore

The square inscribed, is the halfe of the square circumscribed,

scribed.

Item

2 It is greater then halfe the circle circumscribed.

3 If a right line be diuided proportionally, both the angles of the triangle whose feet are equall vnto the line diuided, and the base equal vnto the greater segment, shalbe double at the base vnto the angle remaining, & the base shalbe the side of a pentagon inscribed in a circle with a triangle. 10. 11. p. 4.

4 If two right lines subtend 2. angles following next in order of a pentagon inscribed in a circle, those lines are cut proportionally, and the greater segments are the sides of the pentagon inscribed. ex. 8. p. 13.

Therefore

If a right line geuen, being cut proportionally, bee continued on both sides according to the greater segment, and sixe circumferences made according to the radius of the line geuen doe concur, two on each side from the termes of the line geuen and the line continued, the other 2. from their concourse, right lines drawen through the concourse of those circumferences and the termes of the line geuen, shall make vpon the line geuen an ordinate pentagon.

5 If the diameter of a circle circumscribed about a pentagon be rationall, it is irrationall vnto the side of the pentagon inscribed. ex. 11. p. 13.

6 The radius of the circle, is the side of the hexagon inscribed. c. 15. p. 4.

Therefore

1 Three ordinate hexagons doe fill a place.

Item

2 If right lines drawen from some one angle of an hexagon inscribed, be ioyned to each third angle on both sides, they wil in the circle geuen inscribe an equilater triangle.

7 The side of an equilater triangle inscribed, is in power treble to the radius of the circle. 12. p. 13.

8 If the side of an hexagon be cut proportionally, the greater segment shalbe the side of a decagon.

Therefore

If a

If a decagon, and an hexagon bee inscribed in the same circle, a right line continued from the side of them both shalbe cut proportionally, and the greater segment shalbe the side of the hexagon, and if the greater segment of the right line, being cut proportionally, be the side of the hexagon, the remainder shalbe the side of a decagon. 9.p.13.

9 If a decagon, an hexagon, and a pentagon bee inscribed in the same circle, the side of the pentagon is in power answerable vnto the side of the other two: and if it be in power iust correspondēt vnto the sides of an hexagon and a decagon, it is the side of a pentagon. 10.p.13.

10 If a triangle and a pentagon be inscribed in the same circle at one point, the right line inscribed betweene both their bases opposite vnto the said point, shalbe the side of a quindecagon inscribed. 16.p.4.

Therefore

If a pentagon, and an hexagon be inscribed in the same circle at the same point, the circumference betweene both their sides next vnto the said point, shalbe the 30. parte of the whole circumference.

The 19. booke of P. Ramus his Geometric concerning the Geometrical measure of of a Multangle ordinate figure, and a circle.

THe plaine number made of the perpendicular drawn from the centre to the side, and of halfe the perimeter, is the contente of a multangle ordinate figure.

2 The circumference is treble, and almost one seventh parte of the diameter. Therefore

1 The plane number made of the radius and halfe the circumference is the content of a circle.

C2

Item

Item

2 As 14. is unto 11. so is the square of the diameter unto the circle,

Item

4 The plane number made of the Radius & the quarter of the circumference, is the contents of a semicircle,

Item

4 The plane number made of the Radius and halfe the base, is the content of the sector.

Item

5 If a triangle made of the 2. Radij and the base of the geater section, be added unto the two sectores contayned therein the whole shalbe the content of the greater section: but yf it be taken awaye from his sector, the remaynder shalbe the contents of the lesser section.

Item

6 Of plane ffooperimetrall figures being unequall, the circle is the greatest.

The 20 booke of P. Ramus his Geometrie, concerning a bowed surface.



Bowed surface is that which lyeth vnequallie betwene his termes.

Abowed surface is either spherical, or varied.

3 A sphericall surface is a bowed surface, equallie distante from the centre of the space contayned therein.

Therefore

It is made by the turning aboute of a halfe circumference the diameter standing still. e. 14. d. 11.

4 The greatest circumference in a sphericall surface, is that which cutteth the sphericall surface into 2. equall peeces.

Therefore

The circumference in a sphericall surface which is nexte unto the greatest, is bigger then that which is further of,
and

and the 2. circumferences equallye distante on each side from the greatest, are equall.

- 5 The plane number made of the greatest circumference, and the diameter thereof, is the content of the sphericall surface. Therefore

1 The plane number made of the greatest circle and 4 is the content of the sphericall surface. Item

2 As 7 is vnto 22. so is the square of the diameter vnto the sphericall surface. Item

3 The plane number made of the greatest circumference and the Radius, is the contente of halfe the sphericall surface

- 7 If halfe the sphericall surface be increased accordinge to the parte of the Radius drawen from the centre prependicular vnto the base of the greater section, the whole shalbe the greater section of the spherical surface, but if it bee diminished according to the said parte, the Remayner shalbe the lesser section.

7 A varied surface is a bowed surface, whose base is a circumference, and the side is a right line drawen from the terme of the toppe, to the terme of the base.

8 A varied surface is either conicall, or cylindrical.

9 A conicall surface, is that which from the circumference at the bottome groweth narrower and narrower equallie, to a poynte in the toppe.

Therefore

It is made by turning the side round about the circumference at the bottome.

10 The plane number made of the side and halfe the base, is the content of the conicall surface.

11 A cylindricall surface is that which is equallie rayed vp from the circumference at the botome to the circumference at the toppe, equall and parrallele

vnto that in the bottome.

Therefore,

*It is made by turning the side aboute 2. circumference
equall and parallele.*

12 The plane number made of the base and the altitude, is the contente of the cylindricall surface.

The 21. booke of P. Ramus his geometric, concerning lines and surfaces in a solide.



Bodie is a lineate, broade and highe. 1. d.

11.

2 The terme of a solide, is a surface. 1. d.

11.

3 If a right line be perpendicular in the common section, vnto right lines beinge cut one by another in the subiect plane: it is perpendicular vnto the subiect plane: and if it be perpendicular to the subiect plane, it is perpendicular in the common section to the lines cut one by another in the subiect plane. e. 3. d. & 4. p. 11.

4 If 3. right lines being cut one by another be perpendicular in their common section, to one and the same right line, they are in one plane surface. 5. p. 11

5 If two right lines be perpendicular vnto a subiect plaine, they are parallele: and if one of the two paralleles be perpendicular to a subiect plaine, the other also is perpendicular vnto the same. 6. 8. p. 11.

6 If right lines in diuers plaines, bee parallele vnto some one right line, they are parallele one to the other. 9. p. 11.

7 If two right lines be perpendicular, the first from a point aloft to the right line beneath: the second from the common section of those two lines made in the subiect plaine: a third line drawn from the aforesaid point,

point, perpendicular vnto the second line, shalbe perpendicular vnto the subiect plaine. e. 11. p. 11.

8 If a right line drawn from a point geuen in a subiect plaine, be parallele vnto a right line perpendicular vnto the same plaine, it shal also be perpendicular vnto the subiect plaine. e. 12. p. 11.

9 If a right line in one of those two planes which are cut one by the other, being perpendicular vnto the common section, bee perpendicular vnto the other plaine, the plaines are perpendicular. And if the two planes be perpendicular, the right line in the one being perpendicular vnto the common section, is perpendicular vnto the other. e. 4. d. & 18. p. 11.

10 If a right line be perpendicular vnto a plaine, all the plaines passing by it, are perpendicular vnto the same plaine: and if two plaines cut one by the other, be perpendicular vnto any one plaine, the common section is perpendicular vnto the said plaine. e. 15. 19. p. 11.

11 The plaines are parallele, which in no place bend one toward another. 6. d. 11.

Item

They also are parallele that are diuided with one common perpendicular. 14. p. 11.

Item

If the two right lines, hauing the same common terme in them, be parallele, the planes are also parallele. 15. p. 11.

Item

If two parallele plaines be cut by a plaine, the common sections are parallele. 16. p. 11.

The 21. booke of P. Ramus, his geometry concerning a Pyramis.

THe axe of a solide, is the diameter about which it is turned. e. 15. 19. 22. d. 11.

2 An vpright solide is that, whose axe si perpendicular

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dicular to the centre of the base.

3 If solides be conteyned vnder homogeneall surfaces, equal both in multitude and magnitude, they are equall. 8. d. 11.

4 If solides be conteyned vnder surfaces equall in multitude, and like, they are like. 9. d. 11.

5 Like solides haue the treble proportio of their correspondent proportionall sides, and two meane proportionalles. 33. p. 11. 8. p. 12.

6 A solide, is either plaine, or bowed.

7 A plaine solide is that, which is conteyned vnder plaine surfaces.

8 The plaine angles, conteyning a solide angle, are lesse then foure right angles. 21. p. 11.

9 If thret p'aine angles, lesse then the foure right angles, do comprehend a solide angle, any two of them are greater then the third remayning: and if any two be greater then the third remayning, they shall comprehend a solide angle. 20. 23. p. 11.

10 A plaine solide is either a Pyramis, or a Pyramide.

11 A pyramis is a plane solide growing equally from the right lined base, narrower & narrower, to a point in the toppe.

Therefore

The sides wheron the pyramis may stande, are more by one then the angles in the base.

Item

2 A pyramis is a prime figure among the solide figures.

Therefore

3 Pyramides of equall heighth are as the bases. 5. 6. p. 12.

Item

4 Pyramides reciprocally in their base and altitude are equall. 9. p. 12.

12 A Tetraedron is an ordinate pyramis conteyned vnder 4. triangles. 26. d. 11.

Therefore

1 The sides of a tetraedron are sixe; the plaine angles 12.

The

the solide angles foure.

Item

2 Twelue tetraedrons fill a solide place.

Item

3 If foure triangles ordinate and equall be ioyned together at solide angles, they will comprehend a tetraedron.

13 If a right line being in power sesquialter vnto the side of an equilater triangle, be cut by double proportion, the double segment perpendicular vnto the centre of the triangle, ioyned with the angles therof, will conteine a tetraedron. 13. p. 13.

The 23. booke of P. Ramus his geometrie, concerning a Prisme.



Pyramidate, is a plane solide made of Pyramides.

2 A pyramidate is a prisme, or a mixt polyedron.

A prisme is a pyramidate whereof 2. opposite planes are equall, like and parallel, the other are parallelogrames. 11. d. 11.

Therefore

The sides wheron the prisme maye stand are more by two, then the angles in the base.

4 The plane number made of the base, and the altitude is the solide content of an vpright prisme.

5 A prisme is treble vnto the pyramis, equal in base and altitude. c. 7. p. 12.

Therefore

1 The plane made of his base and the third parte of the altitude, is the solide contente of the pyramis equall in base and altitude.

Item

2 Homogeneall prismes being of equall heighth, are as their bases. 29. 30. 31 p. 11.

Item

3 If prismes bee reciprocal in the base and altitude, they are equall. 34. p. 11.

Item

4 If a prisme be cut by a plane parallele to the opposite sides

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sides wheron the prisme maie stand, the segments are as the bases. 25. p. 11.

6 A prisme is a pentaedron, or made of pentaedrons.

7 If pentaedrons one hauing a triangle base, the other a parallelogramme double vnto the triangle base, be of equall height, they are equall the one to the other. 47. p. 11.

8 A prisme made of pentaedrons; is either an hexaedron, or a polyedron. An hexaedron is a parallelepipedon, or a trapezium.

9 A parallelepipedon, is an hexaedron whose opposite planes are parallelogrammes. e. 24. p. 11.

Therefore

1 It is cutte into 2. equall peeces by a plane, passinge through the diagonall lines of the opposite sides.

Item

2 If it be cut into 2. equall peeces, by 2. planes diuiding equallie the opposite sides; the common section and the diagonal line, are equallie diuided one by another. 29. p. 11

10 If 3. right lines be proportionall, the parallelepipedon made of the midle line, is equall vnto the equiangle parallelepipedon made of the all. e. 36. p. 11

11 Eight right angled parallelepipedons fil a solide place.

12 The figured number of a right angled parallelepipedon, is called a solide number, made of 3. numbers. 18. d. 7

Therefore

If 2. solide numbers be like, they haue their sides proportionall, and two meane proportionall numbers. 21. d. 7. 19. 21. p. 8.

The 24 booke of P. Ramus his geometrie, concerning a cube.

A Right angled parallelepipedon, is either a cube or an oblong.

uinz A cube is a right angled parallelepipedon, ha-
g 6. equall surfaces 21. d. 11.

Therefore

1 The sides of a cube are 12. the plaine angles 24. the so-
lide angles 8.

Therefore

2 If 6. equall squares be ioyned together at solide angles,
they shal comprehend a cube.

Item

3 If from the corners of a square, perpendicular lines e-
quall vnto the sides be ioyned together aloft as the toppes,
they shall comprehend a cube. e. 15. p. 11.

3 The diagonall line of the cube is in power triple
vnto the side.

4 If of 4. right lines in continuall proportiō, the first
be halfe of the fourth, the cube of the first shall be half
as great as the cube of the second. e. 33. p. 11.

5 The solide number of a cube is called also a cube,
namely, a solide number of equall sides. 19. d. 7.

Therefore

It is made of a number multiplied by his owne square.

6 If a right line be cut into 2. peeces, the cube made
of the whole line shall be equall vnto the cubes made
of the peeces, & to the 2. solides cōprehended 3. times
vnder the square of his segment, and the segment re-
mayning.

Therefore

*The side of the first particular cube, is the one side of the
second solide, and the square of that side is the one side of
the first solide, whose side remainning, is the side of the se-
cond cube, and the square of the same side remainning, is
the other side of the second solide.*

The 25. booke of P. Ramus his geometric
concerning mixt ordinate Polyedrons.

A Mixt ordinate polyedron, is a pyramidate made
of Pyramides meeting together with their tops
in one centre, and lying open only in the base.

2 The heighth of the pyramis making the aforesaide

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polyedron, is founde out by the radius of the circle circumscribed about the base, and by the halfe diagonall line of the polyedron.

3 A mixt ordinate polyedron, hath either a triangular base, or pentagonall.

4 If the square made of the side of the triangulate base be diuided into 3. peeces, the side of the third parte shalbe the radius of the circle circumscribed about the base.

5 A mixt and ordinate polyedron, hauing a triangular base, is either an octaedron, or an icosaedron.

6 An octaedron is a mixt & ordinate polyedron, conteyned vnder 8. triangles. 27. d. 11. Therefore

1 The sides of an octaedron are 12. the plaine angles 24. the solide angles 6. Item

2 Nine octaedrons doe fill up a solide place. Item.

3 If 8. equilater and equall triangles be ioyned together at solide angles, they shal containe an octaedron.

7 If a right line perpendicular on each side to the centre of a square, and equall vnto halfe the diagonal line, be ioyned with the angles of the square, it shall comprehend an octaedron. 14. p. 13. Therefore

1 The diagonal line of an octaedron is in power double vnto the side thereof. Item

2 If the square made of the side of an octaedron bee doubled, the side of the doubled square shall be the diagonall of the octaedron.

8 An icosaedron, is a mixt ordinate polyedron, conteyned vnder 20. triangles. 29. d. 11. Therefore

1 The sides of an icosaedron are 30. the plaine angles 60 the solide angles 12. Item

2 If 20. triangles, ordinate and equall, be ioyned together at solide angles, they shall comprehend an icosaedron.

9 If 3. ordinate figures, namely 2. pentagons, and one decagon, be so inscribed in the same circle, that the side of both the pentagons subtend 2. sides of the de-

agon, 6. right lines perpendicular vnto the circle. & equall vnto the radius thereof, 5. of the being drawn from the corners of one of the pentagons, & ioyned both one vnto another, and with the corners of the other pentagon, the sixth cōtinued on both the sides from the centre according to the length of the side of the decagon, and ioyned on the one side with the 5. perpendiculars, on the other side with the angles of the second pentagon. Those sixe lines aforesaid shal containe an icosaedron. e. 16. p. 13.

10 The diagonall line of an icosaedron, is irrationall to the side.

11 It is in power quintuple vnto the radius of a circle

12 A mixt ordinate polyedron, whose base is pentagonall, is that which is conteyned vnder 12. pentagons, and it is called a dodecaedron.

Therefore

1 The sides of a dodecaedron are 30. the plane angles 60. the solide angles 20.

Item

2 If 2. ordinate and equall pentagons be ioyned at right angles, they will conteyne a dodecaedron.

13 If the sides of a cube bee diuided into two peeces with right lines, and three halfes of the lines making the diuision in plaines nexte adioyning, those lines neither meeting together, nor yet parallele, two of them being the halfes of one line, the third being the next halfe of the line remaining, be so proportionally cut, that the lesser segments may limite a line, making the equall partition, three right lines drawn without the cube perpendicular to the aforesaid planes from the points of the proportionall sections, equall vnto the greater segments, ioyned together, two from the same line, making the equall section one with another, and with the next angles of the cube, the third with the same angles, they shall comprehend a dodecaedron. 17. p. 13.

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14 The diagonall is irrationall to the side of a dodecaedron.

15 If the side of a cube bee diuided proportionally, the greater segment shalbe the side of a dodecaedron

16 There are but onely five plaine ordinate solides.

The 26. booke of P. Ramus his geometric, concerning a Sphere.

A Bowed solide, is that which is conteyned vnder a bowed surface.

2 A bowed solide is either a sphere, or a varied solide.

3 A sphere is a round bowed solide.

A sphere is made by the turning about of a semicircle the diameter standing still. 14.d. 11.

4 The greatest circle of a sphere, is that which cutteth the sphere into 2. equall peeces. Therefore

1 The circle next vnto the greatest, is greater then that which is farthest of. Item

2 Those which are equidistant fro^e the greatest, are equal.

5 The plane number made of the diameter, and the sixte parte of the sphericall surface, is the sphere.

Therefore

1 As 21. is vnto 11. so is the cube of the diameter, vnto the sphere. Item

2 The plane number made of the radius and of the sixte parte of the sphericall surface, is the hemisphere.

6 Spheres haue the treble proportion of their diameters. 18.p. 12.

7 The 5. ordinate bodies are inscribed in the same sphere, by the conuersion of a semicircle, hauinge for the diameter, in the tetraedron, a right line being in power sesquialter vnto the side of the tetraedron, in the other fower ordinate bodies, the diagonall line of the ordinate bodie it selfe.

8 By the proportion of the Axe of the sphere, the

sides of the tetraedron, cube, octaedron, dodecaedron, are founde out.

9 If a right line equall vnto the axe of the sphere, and perpendicular vnto it from the one terme, be ioyned to the centre, the right line from the section of the circumference, to the said terme, shalbe the side of an Icosaedron.

10 Of the 5. ordinate bodies inscribed in the same sphere in respect of the greatnes of the side, the tetraedron is the first; the Octaedron seconde: the cube, thirde: the Icosaedron fourthe; the dodecaedron, fift.

The 27. booke of P. Ramus his geometrie, concerning the cone and cylinder.

A Varied solide, is that which is conteyned vnder a varied surface, and a base.

2 If varied solides haue their axes proportional vnto the diameters of their bases, they are like. 24. d.

11.

3 A varied solide, is a cone, or a cylinder.

4 A cone is that which is conteyned vnder a conicall surface, and a base.

Therefore

1 It is made by the turninge aboute of a right angled triangle, one foote thereof standing still

Item

2 The cone is right angled, if the foote which standeth still be equall vnto that which is turned about. If it be lesser, the cone is obtuse angled, if it be greater, the cone is acute angled. e. 18. d. 11.

Item

3 Among varied figures the cone is a prime figure.

Item

4 Cones of equall heighth, are as their bases. 11. p. 12.

Item

5 Being reciprocall in their base, and altitude, they are equall. 15. p. 12.

A cylinder is that, which is conteined vnder a cy-

Ramus his Geometrie.

indricall surface, and opposite bases. Therefore

It is made by the turning about of a right angled parallelograme, the one side thereof standing still. 21. d. 11.

6 The plane number made of the base and the altitude, is the solide contente of a cylinder.

7 A cylinder is treble vnto the cone, equall in base and heighth. 10. p. 12. Therefore

1 The plane number made of the base, and the thirde parte of the altitude, is the solide content of a cone, equall in base and heigthe. Item

2 Cylinders of equall heighth, are as their bases. 11. p. 12. Item

3 Being reciprocal in base and altitude, they are equall. 15. p. 12. Item

4 If a cylinder be cut by a plane surface parallele vnto the opposite bases; the segmentes are in proportion, as their axes. 13. p. 12.

8 The sector of a sphere, is a segment of a sphere which is conteyned on the outside vnder a sphericall surface, on the inside vnder a conicall surface limited in the centre: the greater sector is comprehended vnder a concaue conicall surface; the lesser sector, vnder a conuexe.

9 The plane number made of the diameter and the sixte parte of the greater or lesser sphericall surface, is the greater or lesser sector.

10 If the greater sector be increased by the cone within the midst thereof, the totall shalbe the greater section: If the lesser sector be diminished, the remainder shall the lesser section.

5 AP 58
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